

OBITUARY

**Juro Ishida (1908-1994)**

In deep sorrow, we have to announce that Dr. Juro Ishida, Professor Emeritus of the University of Tokyo, passed away at the age of 86 on July 22, 1994. He had suffered from a thrombosis in the brain for the last several years and had hardly been able to carry out his duties as chief director of the Ito Foundation for the Advancement of Fish Biology, which was the last sign of his devotion to science. We deeply regret the loss of our teacher and of this very influential zoologist, developmental physiologist and biochemist. Juro Ishida was born in 1908 in Gohtsu-city in Shimane Prefecture. After graduation from Matsue Higher School, he entered the Imperial University of Tokyo (now the University of Tokyo), majoring in zoology. He then went on to the graduate school of that university and studied experimental zoology under the guidance of Professors Naohide Yatsu and Tokusuke Goda.

While in the graduate course, he became a researcher in the Mitsui Institute of Marine Biology near Shimoda, Shizuoka Prefecture, where he was actively engaged in studying digestive proteases in some marine vertebrates and invertebrates. Soon afterward, this line of study led him to his monumental discovery of a hatching protease in sea urchin embryos in 1936. This was the first documentation of the hatching enzyme in echinoderms. Afterward he moved from the Mitsui Institute to the Division of Fisheries, Department of Agriculture and Forestry, the Karafuto Agency, and lived in Karafuto (now Sakhalin in Russia) for one and a half years. Then in 1938 he resumed his graduate studies at the Imperial University of Tokyo. He continued research work in basic biology again under the guidance of Professor Tokusuke Goda, who was developing physiological chemistry in the field of zoology in Japan. During the period of his graduate studies, Ishida devoted himself to the study on proteolytic phenomena in animal tissues, for example, proteolytic activity in mammalian liquor folliculi in relation to its ovulatory activity and regulation of the autolytic activity of some tissues.

In 1942, he became a lecturer at the Biological Institute, Faculty of Science, Nagoya Imperial University (now Nagoya University). One and a half years later, he was appointed Associate Professor in the Institute. There he started his research work succeeding in 1944 in the first identification and physiological analysis of the hatching enzyme of the teleost (medaka), *Oryzias latipes*. He obtained the degree of Dr. Sc. in 1945. He also made further studies on the sea urchin hatching enzyme that he had discovered previously. During his time in Nagoya, his interest seemed to be concentrated on hatching phenomena, and later on the fertilization of sea urchins, a research carried out in cooperation with Dr. Eizo Nakano, his first student at Nagoya. Besides his own experimental investigation of hatching, Ishida dug out the historical fact that the first experimental study on enzymatic hatching in animals was done in 1910 by a Japanese investigator, Ikumo Moriwaki. He introduced Moriwaki's work to Japanese zoologists in 1944. Moreover, in 1948 he published two excellent books on the hatching enzyme and animal hatching. They were the first comprehensive monographs on animal hatching published anywhere in the world.

In 1950, Ishida moved to the Zoological Institute, Faculty of Science, the University of Tokyo as an Associate Professor. After 1951, he was joined gradually by students who were not only interested in Ishida's research project but who were also attracted to his unauthoritarian and affable personality. When Ishida was building his research group at the University of Tokyo, the remarkable progress in biological sciences after the World War II was just bursting and a flood of information on research in biochemistry and physiology done during and after the war mostly in the U.S.A. was surging into Japan to fill the wartime blank. With intensive interest in extensive fields of biochemistry and developmental biology, Ishida energetically introduced the newest information and trends in these scientific fields to his students and to all other zoologists and students of biology in Japan. Thus, we are greatly indebted to Ishida for accumulation and increase in our knowledge of trends in biochemistry and developmental physiology after the World War II. The so-called "Ishida School" comprised more than 25 his students. Many of them, though active and diligent, were unique and tough in their character and not so docile. Ishida, however, treated his students generously and impartially to help them mature responsibly at their own will and pace. This style of guidance has brought it about that among his former students there are experts in fields ranging from social biology to molecular biology, as well as in biochemistry and developmental physiology.

In 1956, he moved to the Biological Institute, College of General Education of the University of Tokyo at Komaba as Professor, while maintaining his laboratory at the Zoological Institute and setting up a new laboratory at Komaba. The subjects of research for his students were various depending on the interest of his students as well as his own: those related to the hatching enzyme, fertilization, metabolism of spermatozoa, metabolic changes during embryonic development, metabolism of endocrine organs, mitochondrial activity, muscle proteins and muscular contraction, and digestive enzymes. More than one hundred papers dealing with the above mentioned subjects were published from his laboratory over about 10 years. Being deeply impressed by the publication list of Ishida's laboratory, Professor John Runnstrom, the leader of the Swedish school in the field of developmental physiology at that time, highly praised Ishida for his interest, insight and activity in so a great variety of fields of physiological chemistry when he introduced Ishida at a meeting of the Royal Academy of Sciences of Sweden. The research projects born in his laboratory have been extended and developed markedly by his former students and their students. During the latter half of his time at Komaba, he actively committed himself to the establishment of a new Laboratory of Cooperative Biology in a new Department of Pure and Applied Sciences of the Komaba College. This new laboratory aimed at educating a new type of biologist well-grounded in physical and chemical science. He considered Dr. Norbert Wiener to be an example of such a scientist. This laboratory is well known to be adhering to Ishida's goals even now, nearly 30 years after its establishment.

In 1965, he moved back again to the Zoological Institute and headed his new laboratory of Developmental Physiology until 1968 when he retired from the University of Tokyo. After retirement, he continued for 5 years to teach biology as a Professor in the Department of Biology, Faculty of Science and Engineering, Saitama University, and for more 5 years in the Department of Biology, Faculty of Science, Toho University. At Saitama University, he successfully undertook painstaking administrative work as Dean of the Faculty and Acting President of the University, during a period when all Japanese universities, including Saitama University, encountered difficult problems, because of the students' movement. At Toho University, he enjoyed talking about biology to his young students, even while he was still quite busy in administration as a councillor and a member of the board of trustees.

Ishida belonged to many academic societies such as the Zoological Society of Japan, the Japanese Society of Developmental Biologists, the Japan Society for Cellular Chemistry (now the Japan Society for Cell Biology), the Japanese Biochemical Society, and the International Society of Developmental Biology. He made a great contribution to these societies by serving as secretary, councillor, or member of the advisory board. Even after his death, his influence will continue to stimulate progress in physiological chemistry and developmental physiology in Japan. Dr. Ishida is survived by his beloved wife, Michiyo, five children and twelve grandchildren.

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